REMARKS

By the foregoing amendments, Applicant has amended claims 26, 57, 72-74, 76, 90, and 91. Claims 27, 86-89, and 94 have been cancelled. New claims 95 and 96 have been added. Thus, claims 26, 28-85, 90-93, and 95-96 are pending in the application and are presented for reconsideration and further examination in view of the amendments and the following remarks.

Attached hereto is a marked up version of the changes made to the claims by the current amendment. The attached pages are captioned **VERSION WITH MARKINGS TO SHOW CHANGES MADE**. The changes are indicated by underlining insertions and ~~deletions are stricken through~~.

Objections to the Specification and Claims

The specification and claims 63-71 and 73 were objected to because of informalities.

The specification and claims 63-71 were objected to for using the phrase "gain droop" in contrast to the use of the phrase "gain drop." The phrase "gain drop" had been used in Figure 3. The use of gain drop in Figure 3 was a typographical error. Attached is a SUBMISSION OF DRAWING AMENDMENT FOR EXAMINER APPROVAL for approval by the Examiner to correct the typographical error in Figure 3. The phrase "gain drop compensation module" should be "gain droop compensation module." It is respectfully submitted that this amendment renders Figure 3 fully consistent with the text of the specification as filed and that no new matter has been added.

The specification was objected to for using two identifiers, 100 and 135, with the word "modem." As recommended by the Examiner, Applicant has corrected the specification to only associate the identifier 100 with the word "modem" as is illustrated in Figure 1. It is respectfully submitted that this change has added no new matter.

Claim 73 was objected to for using the phrase "a phase calculator circuit configured to determine the gain of the equalizer." The phrase has been replaced with the phrase "gain droop compensation loop." The phrase "gain droop compensation loop" is found on page 7 beginning at line 22 of the specification. Applicant submits that this amendment to claim 73 adds no new matter.

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In view of the above, Applicant respectfully submits that all of the objections to the specification and claims have been overcome.

§112 Rejections

In the Office Action, claims 57-60 and 86-89 were rejected as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. With regard to claim 57, the Office Action states that the limitation of "determining an expected modulation time for the subsequent burst from the remote site based on the determined initial phase and the initial gain" is not supported by the specification in the instant application.

In order to clarify the meaning of the claim, Applicant has amended claim 57. More specifically, Applicant has replaced the phrase "the subsequent burst" with the phrase "a subsequent burst" to clarify that the expected modulation type is being determined for a subsequent burst from the next remote site. Applicant has further amended claim 57 to clarify that the selected adaptation factor is applied to the subsequent burst from the next remote site.

With regard to the specification providing support for the determination of an expected modulation type, please see page 8, line 22, through page 9, line 6 of the specification, which describes this process. Additional description for determining the modulation type is provided in Figure 12 and its associated text. For example, page 16, lines 15-21, describes such a process. Applicant submits that the §112 rejection has been overcome.

Applicant further submits that the §112 rejection has been overcome with respect claims 58-60 which depend from amended claim 57.

Applicant has cancelled claims 86-89. Thus no additional discussion of claims 86-89 is warranted at this time.

§103 Rejections

In the Office Action, claims 26-28, and 30 were rejected as being obvious in view of the combination of Kamerman, U.S. Patent 4,849,989, and Kamerman, U.S. Patent 4,849,996. In response, Applicant has amended claim 26 by incorporating dependent claim 27 into claim 26.

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The amendment to claim 26 clarifies that the attenuation levels and equalizer tap values, which are determined for the next remote site, are based on a previous burst from that next remote site.

This is in contrast to Kamerman, U.S. Patent 4,849,989, which recalls tap values that are determined during a long training sequence. The long training sequence is used during the first transmission and not during subsequent transmissions. The tap values determined during the long training sequence are a starting point modem adaptation of an incoming signal. As stated in Kamerman at column 4, line 61, to column 5, line 6: "[I]ncluded in the modem receiver is a receiver parameter storage unit 240 (Figure 3B) . . . which is used to store equalizer coefficients and receiver parameters at locations associated with the respective transmitting modems during initial training sequences and to retrieve the stored coefficients and receiver parameters during subsequent training sequences. At the commencement of the first transmission by each of their modems, 14, 16 and 18, there is transmitted an initial training sequence consisting of six segments." Thus, Kamerman stores values that are determined during the long training sequence and retrieves those stored values for use with the subsequent training sequences. Tap values are not determined during the subsequent training sequences. Thus, Kamerman does not disclose or teach determining equalizer tap values based on a previous burst from the next remote site as in claim 26.

The use of the tap values derived during the initial training sequence is less advantageous than using tap values derived from the previous burst when the channel distortions are slowly changing. In this case, Kamerman could recall tap values that had been determined a long time ago and which would not reflect the ongoing increase in channel distortions which had been occurring since the initial training sequence. Applicant's method as described in claim 26 can continually adjust for changing channel distortions that occur since the initial training sequence.

Amended claim 26 is further distinguishable since the limitation, "determining an equalizer phase error from the determined equalizer tap values for the next remote site," among other aspects of the claim, is not disclosed in or taught by the references of record. In embodiments of Applicant's modem system, the equalizer can compensate for rapidly varying phase changes as well as slow variations in phase error. More specifically, in one embodiment the digital phase lock loop 950 corrects for the rapidly varying phase changes experienced during

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demodulation of a data burst. Additionally, the equalizer compensates for some residual phase error which typically follows a slower rate of change in phase variation. However, tap values retained by the equalizer for the current burst retain a memory of this phase compensation. Thus, the tap values, when recalled for the next burst from the current remote site, will attempt to compensate for these variations in phase error. In this way, the recalled taps will be uncorrelated to what happened on the previous burst. By "determining an equalizer phase error from the determined equalizer tap values for the next remote site", applicant's claim 26 can correct for the phase error which may be retained in the tap values and which relate to slow variations in phase change. In this way, the equalizer phase error compensates for errors in the stored tap values which are derived from phase variations that may not be present during subsequent bursts from the current remote site.

In the Office Action, Kamerman, U.S. Patent 4,849,996, was cited as teaching that the signal from an equalizer is used to provide a phase error output signal which is applied to a phase jitter compensation determination circuit. The Office Action further states that it would have been obvious to one of ordinary skill in the art to incorporate the determination of a phase error output signal for phase compensation in the modem system of Kamerman, U.S. Patent 4,849,989, so fast phase jitter adaptation may be achieved. However, the phase jitter compensation determination circuit does not "determine an equalizer phase error from the determined equalizer tap values" as in claim 26.

The Kamerman reference 4,849,996 describes learning the optimum phase compensation loop bandwidth on a per subscriber basis. Thus, the Kamerman reference determines the optimum bandwidth for each modem which communications with a master modem. Once the optimum bandwidth is determined, the bandwidth information is stored and retrieved when receiving subsequent bursts from each modem. As explained in column 1, lines 17-30, and at column 11, lines 3-5, the compensation system described in Kamerman is correcting for variations in <u>frequency offset</u> and <u>phase jitter</u>. Such a compensation system is useful where the subscriber units are using different radios, and thus there may be slight variations in their carrier frequencies. In contrast, Applicant's amended claim 26 is not correcting for such variations. One of skill in the art will recognize that <u>carrier</u> phase jitter and <u>carrier</u> frequency offset is not the

same as nor do they teach determining an equalizer phase error from the determined equalizer tap values for the next remote site as described in applicant's amended claim 26.

Moreover, the need to compensate for tap values which have been affected by slow variations in phase may not have been recognized in the Kamerman reference due to the low frequency at which the Kamerman modem operates. In contrast, Applicant's modem operates at very high frequencies which can induce such phase error as described above.

Therefore, Applicant respectfully submits that this aspect of claim 26, among other aspects of the claim, is not disclosed in or taught by the references of record.

Claim 27 has been cancelled. Claims 28-36 and 40-61 depend directly or indirectly from amended claim 26. Thus, claims 28-36 and 40-61 are distinguishable in view of the art of record for at least the same reasons as amended claim 26.

With regard to claim 72, claim 72 has been amended to clarify that the feed forward tap update module generates tap values based on <u>a previous burst</u> from one of the plurality of remote sites. The arguments made above with respect to claim 26 thus apply with equal force to amended claim 72. This aspect of claim 72, among other aspects of the claim, distinguishes claim 72 in view of the art of record.

With regard to claim 76, claim 76 has been amended to clarify that a feed forward tap update module generates equalizer tap values based on <u>a previous burst</u> from one of the plurality of remote sites. The arguments made above with respect to claim 26 thus apply with equal force to amended claim 76. This aspect of claim 76, among other aspects of the claim, distinguishes claim 76 in view of the art of record. Claim 77 depends directly from amended claim 76. Thus, claim 77 is distinguishable in view of the art of record for at least the same reasons as amended claim 76.

Amended claim 90 clarifies that the reed solomon decoder is configured to determine new channel characteristics and metrics for a demodulated burst from a remote site, <u>wherein the demodulated burst was demodulated with channel characteristics and metrics from a previous burst from the remote site.</u> In view of the arguments above with respect to Claim 26, this aspect, among other aspects of claim 90, distinguishes claim 90 in view of the art of record.

Claim 91 was rejected as being obvious in view of the combination of Kamerman, U.S. Patent 4,849,989, and Tsujimoto, U.S. Patent 6,075,808. Amended claim 91 clarifies that the

correlation is performed based on equalizer tap values. More specifically, the phrase "based on equalizer tap values" has been added to claim 91. In view of the discussion above with respect to claim 26, applicant respectfully submits that the art of record does not disclose or teach "correlating the input and output of an equalizer for a received data burst from a next remote site based on equalizer tap values." Therefore, Applicant respectfully asserts that amended claim 91, among other aspects of the claim, is distinguishable over the art of record.

In the Office Action, claims 63-67, 71 and 73 were rejected as being obvious in view of the combination of Kamerman, U.S. Patent 4,849,989, and Murakami, U.S. Patent 4,575,857, and further in view of Chevillat, et al., U.S. Patent 4,775,988.

Regarding claim 63, the Office Action admits that Kamerman does not expressly disclose that a gain constant is determined based on the equalizer tap values as the scaling of the input signal of a next burst to the equalizer to achieve a gain value of 1. The Office Action relies on Murakami to show an automatic equalizer having controllable tap gains and a tap correcting means for successively correcting the tap gains of the transversal filter. In addition, the Office Action relies on Chevillat to teach a method for rapid gain acquisition in a modem receiver where a scaling means 59 uses a gain correction factor initially set to 1.0. However, the Murakami and Chevillat references do not disclose or teach "determining a gain constant for an equalizer based on the received equalizer tap values" as in claim 63. Thus, Applicant respectfully traverses this ground of rejection.

Embodiments of the invention of claim 63 can correct for gain droop in a modem transmitter. For example, while the modem transmits, its transmission power may decrease or droop as the modem transmitter heats up. If left unchecked, the equalizer will correct for this condition by changing the tap values during the transmission. The unchecked taps would then be stored. When the unchecked tap values are recalled for use during the next burst from the same transmitter, the tap values would be uncorrelated since the modem transmitter would not initially experience the gain droop at the beginning of the burst. To prevent the stored tap values from being tainted by the gain droop, embodiment of the invention drive the tap values to a gain value of 1. Thus, the tap values at the end of the burst have no gain component.

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In contrast, the Murakami reference is concerned with the situation when the absolute value of the taps becomes very large even though the frequency response of the incoming signal is reasonable. In such a case the tap values are said to diverge. To correct for this divergence, the Murakami patent updates the tap values by selecting more reasonable absolute values instead of the very large tap values. In this case the newly selected tap values provides the same compensation as the very large tap values while avoiding the above-mentioned divergence. The Murakami reference does not teach or suggest the claimed determining and scaling steps.

The Chevillat reference does not cure these deficiencies. Its gain correction factor does not set a gain constant based on the equalizer tap values as in claim 63. As stated in Chevillat: "The rapid gain acquisition procedure of the invention is based on the following principle: From the peak value of the signal samples in the input buffer, and from the average energy of the samples in the receiver filter and equalizer, it is determined whether the gains of amplifiers must be changed." (col. 3, ll. 7-12). The peak values of the signal samples in the input buffer or the average energy of the samples in the receiver filter and equalizer as described in Chevillat are not equalizer tap values. Thus, the combination of Murakami and Chevillat does not teach or suggest the claimed determining or scaling steps. Thus, applicant respectfully submits that these aspects of claim 63, among other aspects of the claim, are not disclosed in or taught by the references of record.

Amended claim 73 now states that the gain droop compensation loop is configured to determine the gain of the equalizer based on an equalizer tap value. Therefore, the arguments discussed above in connection with claim 63 apply with equal force to amended claim 73.

Claims 64-67 and 71 depend directly or indirectly from claim 63 and thus are patentable for at least the same reasons as claim 63 is patentable. Thus no additional discussion of claims 64-67 and 71 is warranted at this time.

Claims 78-84 were rejected as being obvious in view of the combination of Kamerman, U.S. Patent 4,849,996, and Webb, U.S. Patent 5,828,695. Webb discloses a <u>frame structure</u> where a first part is modulated with a lower order modulation technique and a second part is modulated with a higher order modulation technique. However, Webb does not teach or suggest

a two-part preamble. Moreover, Webb does not use the word "preamble" in its entire specification. Thus, Applicant respectfully traverses this ground of rejection.

Claim 78 is directed to a method that uses a two-part preamble, not a two part frame structure. The two-part preamble uses both low order and high order modulation techniques as described in claim 78. Nowhere does Webb disclose or teach such a two-part preamble. As illustrated in Figure 2 of Webb, the two-part frame structure cited by the Examiner corresponds to the use of a QPSK symbol at the beginning of an uplink or downlink portion of a frame. The QPSK symbol informs the receiving modem as to what modulation will be used for the second part, or data portion, of the frame. The second part of the frame in Webb may use a different modulation technique than QPSK. However, the second part is not a preamble as in claim 78. A preamble differs from the data block in Webb since the data block in Webb is not used to drive the output of an adaptive filter in communication with the modem to a known state as stated in claim 78. "Driving the output of an adaptive filter in communication with the modem to a known state based on the received preamble" is not disclosed or taught by the references of record. Therefore, Applicant respectfully submits that this aspect of claim 78, among other aspects of the claim, is distinguishable over the art of record.

Claims 79-84 depend directly or indirectly from claim 78 and thus are patentable for at least the same reasons as claim 78 is patentable. Thus no additional discussion of claims 79-84 is warranted at this time.

With regard to claim 85, claim 85 comprises a feed forward tap update module configured to generate equalizer tap values based on an initial gain and equalizer error determined from a two part preamble of a data burst. This aspect of claim 85, among other aspects of the claim, distinguishes claim 85 from the art of record in view of the arguments made above with respect to claim 78. Thus no additional discussion of claims 85 is warranted at this time.

New Claims 95 and 96 Have Been Added

Applicant has added new claims 95-96. These claims are similar to pending claims 26 and 63. Applicant submits that these claims are not anticipated or rendered obvious by any of the cited references. Consideration of these claims is respectfully requested.

Allowable Subject Matter

Claims 37-39, 62, 92, and 93 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. In view of the arguments and amendments above, Applicant respectfully submits that claims 37-39, 62, 92, and 93 are now allowable in dependent form.

CONCLUSION

The applicant has endeavored to address all of the Examiner's concerns as expressed in the Office Action. Accordingly, amendments to the claims, the reasons therefor, and arguments in support of the patentability of the pending claim set are presented above. In light of these amendments and remarks, reconsideration and withdrawal of the outstanding rejections is respectfully requested.

Any claim amendments which are not specifically discussed in the above remarks are not made for patentability purposes, and it is believed that the claims would satisfy the statutory requirements for patentability without the entry of such amendments. Rather, these amendments have only been made to increase claim readability, to improve grammar, and to reduce the time and effort required of those in the art to clearly understand the scope of the claim language. If the Examiner finds any impediment to the prompt allowance of these claims that could be clarified with a telephone conference, he is invited to call the undersigned directly.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

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Respectfully submitted,

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Appl. No. : 09/800,268
Filed : March 5, 2001

VERSION WITH MARKINGS SHOWING CHANGES MADE

IN THE SPECIFICATION:

Changes to paragraph starting at line 7, page 7:

The modem 100~~135~~ may be equipped with a process for providing soft resets. A reset signal, while the modem 100~~135~~ is in transmit mode, may occur in several instances. For example, during uplink transmission, a software module may be too slow in sending data to the modem 100~~135~~, as may occur if the data is modulated using quadrature amplitude modulation 64. In such a case, the limited data received by the modem 100~~135~~ may cause an interrupt to be generated. The modem 100~~135~~ then halts the transmit interface and sets a transmit-reset bit. The modem 100~~135~~ then flushes, realigns, and reprograms the necessary buffers. Once this process is completed, the modem 100~~135~~ restarts the transmit interface, completing the reset operation.

Changes to paragraph starting at line 16, page 7:

Similarly, a reset signal may occur while the modem 100~~135~~ is in a receive mode. For example, the modem 100~~135~~ may receive only bad cyclic redundancy check packets. In such a case, the modem 100~~135~~ halts the receive interface and sets a receive-reset bit. The modem 100~~135~~ then flushes and realigns the receive buffers and reprograms the necessary buffers. The modem 100~~135~~ then restarts the receive interface, thus completing the reset operation.

Changes to paragraph starting at line 8, page 15:

Figure 2 illustrates a parameter storage module 933. The parameter storage module 933 contains channel characteristics, in the form of taps, corresponding to each remote site. In one embodiment, each remote site has different tap values, each of which corresponds to a recent communication parameter by the remote site. Since each remote site has different channel characteristic, each remote site's tap values must be stored and retrieved independently. The digital equalization module 930 receives, from the parameter storage module 933, the tap values corresponding to the remote site that is presently sending an uplink burst to the modem 100~~135~~. Once received, the digital equalization module 930 sets the correct channel characteristics for the incoming burst from the remote site which helps the modem 100~~135~~ perform by keeping estimates of the channel characteristics for each transmission from each remote site. In one

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embodiment, the acquisition, tracking and modulation control module 918 generates an index of remote sites and their associated tap values to expedite their retrieval from the parameter storage module 933. After receiving a burst from one of the remote sites, the parameter storage module 933 updates the stored tap values for that remote site.

<u>IN THE CLAIMS:</u>

Claims 26, 57, 72-74, 76, 90, and 91 have been amended as follows:

26. (Amended) A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site, the method comprising:

receiving a data burst from a current remote site;

determining a next remote site which will transmit a next data burst;

determining attenuation levels and equalizer tap values for the next remote site <u>based on a previous burst from the next remote site</u>;

determining an equalizer phase error from the determined equalizer tap values for the next remote site;

replacing attenuation levels and equalizer tap values for the current remote site with the determined attenuation levels and equalizer tap values for the next remote site in an equalizer once the burst from the current remote site is completed;

storing the replaced attenuation levels and equalizer tap values for the current remote site for use with a subsequent burst from the current remote site;

receiving the next burst from the next remote site;

determining an initial phase and an initial gain for the received next burst from the next remote site; and

demodulating the received next burst from the next remote site using the determined initial phase, initial gain, and equalizer phase error.

57. (Amended) The method of claim 26, further comprising:

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determining an expected modulation type for a ~~the~~ subsequent burst from the next remote site based on the determined initial phase and the initial gain for the next burst from the next remote site;

selecting an adaptation factor for the equalizer based on the expected modulation type; and

applying the selected adaptation factor to the subsequent burst from the next remote site such that the probability that the attenuation levels and tap values stored after demodulating the subsequent burst are correct is increased.

72. (Amended) A modem system for demodulating data bursts from a plurality of remote sites using stored channel parameters for the remote sites, the system comprising:

an acquisition, tracking, and modulation control module configured to determine the expected sequence of bursts from a plurality of remote sites for a modem;

a correlation, timing recovery module in communication with the acquisition, tracking, and modulation control module and configured to determine when a burst from one of the plurality of remote sites is received by the modem;

a parameter memory module configured to store equalizer tap values associated with each of the plurality of remote sites identified by the acquisition, tracking, and modulation control module;

a feed forward tap update module configured to generate feed forward equalizer tap values based on a previous ~~the~~ burst from one of the plurality of remote sites for storage in the parameter memory module;

a decision feedback equalization adaptive algorithm module configured to generate feedback equalizer tap values for storage in the parameter memory module;

a first temporary buffer configured to store attenuation levels and tap values recalled by the modem from the parameter storage memory for a next remote site; and

a second temporary buffer configured to store attenuation levels and tap values for a current remote site prior to storing the attenuation levels and tap values in the parameter memory module.

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73. (Amended) A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for gain droop in the modem transmitter, the system comprising:

an equalizer;

a ~~phase calculator~~ gain droop compensation loop circuit configured to determine the gain of the equalizer based on an equalizer tap value for a demodulated data burst from a remote site; and

a processor in communication with the gain droop compensation loop circuit~~phase calculator~~ and the equalizer, and configured to apply the determined gain of the equalizer to at least one equalizer coefficient.

74. (Amended) A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for errors, the method comprising:

retrieving a stored channel parameter associated with a remote site;

demodulating an incoming burst from the remote site using the retrieved stored channel parameter;

determining a noise value for the demodulated burst;

determining an error value for the demodulated burst;

if the determined noise value exceeds a threshold value,

invalidating the retrieved stored channel parameter,

associating a more robust modulation scheme with the remote site;

if the determined error value exceeds a decode error threshold, invalidating the retrieved stored channel parameter; and

storing the valid channel parameter.

76. (Amended) A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and compensates for errors, the system comprising:

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an acquisition, tracking, and modulation control module which determines the expected sequence of bursts from a plurality of remote sites;

a feed forward tap update module configured to generate equalizer tap values based on a previous burst from one of the plurality of remote sites;

a signal to noise (SNR) calculator configured to calculate a received symbol signal to noise ratio for a burst from a remote site;

a reed-solomon decoder module configured to calculate a received symbol decode error rate for the burst from the remote site;

an error recovery module in communication with the acquisition, tracking, and modulation control module and configured to compare the errors calculated by the SNR calculator and the reed-solomon decoder module for the burst from the remote site to threshold values; and

a parameter memory module in communication with the error recovery module and configured to store the equalizer tap values associated with the remote site if the threshold values are not exceeded.

90. (Amended) A modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site and an adaptation factor to improve the probability that the stored channel characteristics will be valid, the system comprising:

a reed solomon decoder configured to determine new channel characteristics and metrics for a demodulated burst from a remote site, wherein the demodulated burst was demodulated with channel characteristics and metrics from a previous burst from the remote site;

a signal to noise ratio calculator module configured to determine the new channel characteristics and metrics for the burst from the remote site;

an adaptive modulation algorithm in communication with the reed solomon decoder and the signal to noise ratio calculator module and configured to compare the determined channel characteristics and metrics; and

an acquisition, tracking and modulation control module in communication with the adaptive modulation algorithm and configured to determine an adaptation factor for use with a next burst received from the remote site based on the comparison.

91. (Amended) A method for operation of a modem system which demodulates data bursts from a plurality of remote sites using stored channel parameters for each remote site which corrects the phase shift caused by the storage of equalizer tap values, the method comprising:

correlating the input and output of an equalizer for a received data burst from a next remote site <u>based on equalizer tap values</u>;

determining an angle of correction for an incoming data burst from the next remote site based on the correlation; and

shifting the incoming data burst by applying the determined angle of correction to the incoming data burst.

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